

**ABSTRACT**

An object is to provide a hydrogen gas humidity control apparatus which removes excess moisture from the fuel gas or performs humidification or dehumidification by adjusting the moisture to keep the humidity in a fuel cell constant at an appropriate level, a fuel cell using the hydrogen gas humidity control apparatus, and a hydrogen gas humidity control method.

By using a moisture carrier or proton conductor, a catalyst and voltage applying means, excess moisture in a hydrogen flow path or in hydrogen chamber is removed, or humidification or dehumidification is carried out by adjusting the moisture. A hydrogen gas humidity control apparatus and a fuel cell are comprised of a fuel-side gas diffusion chamber to which hydrogen gas is supplied, a hydrogen gas chamber to which hydrogen gas is supplied, and a proton conductor which separates the fuel-side gas diffusion chamber 72 from the hydrogen gas chamber 73 and allows water to pass therethrough.